



ECO DESIGN GUIDELINES

FOR COMMERCIAL BUILDINGS



eco
ENVIRONMENTAL
COLLABORATION
OFFICE

ecoCITY of MILWAUKEE

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ACKNOWLEDGEMENTS

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Milwaukee Riverwalk



View of Downtown from the
Milwaukee River

INTRODUCTION

SUSTAINABLE URBAN DESIGN IN MILWAUKEE

Cities possess a singular appeal. The proximity of people and activities in cities facilitates efficient use of land and transportation systems and creation of convivial public spaces. Milwaukee must encourage development of housing, commerce and transportation systems that embrace its urban heritage. The city must recognize its unique assets and build upon its strength as the core of a major metropolitan area.

Coordinated planning and development effectively integrate many elements. Quality housing that enhances a sense of community among neighborhood residents; attractive customer-friendly commercial streets; greenspace offering recreational amenities and a diverse array of transportation options represent only a few of the many elements that, when well designed, contribute to good urban form. Milwaukee must promote urban design value, civic meaning and ecological innovations.

New buildings should be designed in ways that retain the traditional qualities of Milwaukee's architecture. This does not mean that new buildings should nostalgically imitate historical styles. In fact, to do so would be contrary to the creative design traditions that produced Milwaukee's rich architectural legacy. Timeless design principles should be followed that produce architecture that fits with its context and is human scaled. New buildings should be designed to be compatible with neighboring structures, spaces and activities. Visually interesting and human-scaled building facades should prevail over sterile, windowless walls - especially when facing public spaces.

Diversity is the city's unique strength. The rich mix of uses found in Milwaukee's neighborhoods provides convenience, vitality and individual identity. The transportation network binds the city together. Milwaukee must be organized around a transportation balanced to create a legible, walkable and memorable public realm.

Combining good sustainable design with the city's rich architectural heritage will maintain its unique, attractive, "people-friendly" environment and further enhance Milwaukee's residents' quality of life.



Menomonee Valley proposed development



Reed Street Yards proposed office building

HISTORY OF DESIGN GUIDELINES

In 1999, the City of Milwaukee developed a comprehensive plan that identified key land use recommendations and prioritized neighborhood and development issues. One of the key area plans slated for redevelopment was the Menomonee Valley. With help from Menomonee Valley Partners and the Department of City Development, the Menomonee Valley Design Guidelines were created to require urban design principles that promote sustainable neighborhood design. In an effort to spread green design citywide, the Eco Design Guidelines were created to sustain, restore and enhance the livability, character, and stability of Milwaukee's neighborhoods using the Menomonee Valley Design Guidelines as its framework.

The Eco Design Guidelines was a collaboration of various experts, professionals and stakeholders from varying disciplines. The goal was to include input from different professional fields to create a well-rounded document that incorporated good design practices from architecture to urban design.

PURPOSE OF DESIGN GUIDELINES

The purpose of the Eco Design Guidelines is to define the qualities of architecture, urban design, and public space that make for successful projects and communities. They also serve as a tool for guiding individual projects to meet those expectations through the City's design review process. In contrast to the very specific regulations of the City's land use code, the Design Guidelines allow for flexibility and dialogue during project review.

Although the design guidelines by themselves cannot guarantee good design, and are not intended to resolve zoning disputes or address project impacts related to parking or traffic, they are nonetheless a critical part of the design review process. Their role is to set the parameters for discussions about proposed multi-family and commercial projects.

USE OF DESIGN GUIDELINES

The design guidelines are intended for a variety of audiences including developers, design professionals, neighbors, community members, design review board members, Department of City Development staff, and the general public. Each has a specific role in the City's design review process. The guidelines provide all parties with a clear understanding of what the City urges project applicants to strive for in designing new development.

We also encourage developers and design professional to seek other sustainable guidelines. As an incentive for using green standards, projects that complete more stringent guidelines such as LEED or WELL do not have to meet the recommendations set in the Eco Design Guidelines.



Stormwater spiral garden collects and store rainwater at UWM

SITE DESIGN

PURPOSE: Promote and encourage responsible practices that recognize the ecological context, promote access to the river, respect existing landmarks, and improve existing infrastructure (sidewalks, streets, storm drainage).

Sustainable site design should address water quality, quantity and floodplain issues, soil erosion, open space that provides recreation, wildlife habitat, cultural and neighborhood connections; and alternative transportation, lighting and parking design.

1. SITE ANALYSIS & PLANNING

Site planning guidelines are intended to create an integrated site that responds to the site's content and context within the city.

- A. Construct or renovate on previously developed land to promote the preserve of greenfields.
- B. Examine how energy choices may influence building form, siting, and orientation, and factor in the findings when making siting and design decisions.

Recommendations:

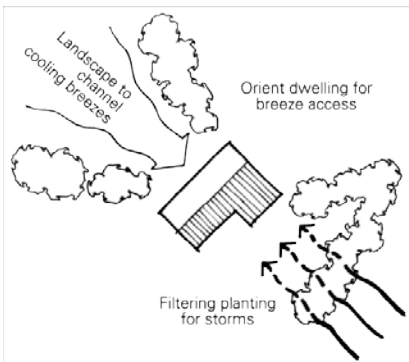
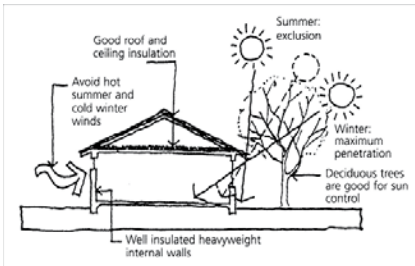
- Take advantage of solar exposure and natural ventilation available on site.
- Use local wind patterns and solar gain to reduce the need for mechanical ventilation and heating.
- Manage direct sunlight falling on south and west facing facades through shading devices and existing or newly planted trees.

- C. From the outset of the development project, integrate natural systems and features on the site as well as its surroundings into the project design.

Recommendations:

- Incorporate existing trees, native plant species or other vegetation into project design
- Connect existing natural features to existing networks of open spaces and natural habitats wherever possible.
- Consider relocating significant trees and vegetation if retention is not feasible.

- D. Use the natural topography and/or other desirable landforms or features to inform the project design.





For information on green infrastructure solutions see:
[Fresh Coast Green Solutions](#)



88Nine Radio Milwaukee's green roof adds extra open space



For tips on planning and installing a native landscape:
[Native Landscape Care](#) from
Fresh Coast 740



Menomonee Valley uses native plantings and helps retain stormwater



For information on transportation alternatives see:
[LEED Pilot credit - Walkable Project Site](#)

For information on electric vehicle charging stations see:
[electric vehicle charging stations](#)

2. GREEN INFRASTRUCTURE

Cost effective natural systems use water efficiently and enhance water quality.

- A. Design your stormwater conveyance system to use green infrastructure for stormwater infiltration to capture the first ½ inch of rainfall from impervious surfaces.

Recommendations:

- Utilize rain gardens, bioswales, green roofs, fountains of recycled water, and/or water art installations.

- B. Design landscape plantings and infrastructure for long-term stormwater collection to irrigate the site's vegetation.

Recommendations:

- Incorporated rain barrels, bioswales, and/or cisterns.

- C. Utilize porous pavers in parking areas and on pedestrian pathways.

3. NATURAL LANDSCAPE

Well-designed landscaping with native species reduces water consumption and long-term maintenance costs and improves building energy efficiency and aesthetics.

- A. Specify native and/or drought resistant plant and tree species for at least 80% of planted area.

- B. Use deciduous shade trees, vegetative cover and exterior structures such as louvers, arbors and trellises to provide 30% shade over non-roof impervious areas within 5 years.

- C. Where rooting area will be limited, use strategies such as connected planting beds, rooting breakouts under parking, or walkways floating on root-permeable soils to extend rooting space and increase plant vigor.

Recommendations:

- Establish engineering specifications for these strategies, drainage patterns, and installation of structural soils as part of the building design and site grading plans.

- D. Use Integrated Pest Management practices and appropriate plantings to eliminate the use of pesticides, herbicides, and fertilizers.

4. PARKING & TRANSPORTATION

Well-designed parking areas efficiently use space, accommodate pedestrians, and are aesthetically pleasing.

- A. Encourage transportation alternatives for employees and visitors.

Recommendations:

- Provide bicycle racks and employee shower/changing facilities.
- Use local bike share programs like Bublr Bikes.
- Provide a company shared vehicle.
- Provide electric vehicle charging stations.
- Install referred parking for carpools.

- B. Provide a buffer of native plantings between parking areas and the river edge.



East Street Plaza proves unique lighting along the river's edge



For more information see:
[DOE's Lighting Energy Efficiency in Parking \(LEEP\) Campaign](#)

- C. Include on-street and shared parking resources in parking calculations.
- D. Minimize parking stall dimensions to 9' x 18', as smaller stalls will decrease the parking lot size and allow for a large building footprint.
- E. Use concrete pavement rather than asphalt where possible to keep parking areas cool.
- F. Consider using porous paving systems to extend the life of the pavement, allow for stormwater infiltration, reduce maintenance costs, and reduce the urban heat island effect in summer.

5. SITE LIGHTING

Effective and efficient site lighting improves aesthetics, reduces energy use and maintenance, and promotes pedestrians' safety.

- A. Provide site lighting appropriate for the security needs of the site and pedestrians while maintaining an overall "low-lighting profile" for the complex.

Recommendations:

- Use LED lighting with low cut off angles and down-lighting for landscaping.
 - Allow zero direct-beam exterior lighting at the property line.
- B. Utilize reflective lighting fixtures and edges to reduce or eliminate glare and provide safer, more human-scaled nightscapes along driveways or walkways.



Milwaukee Public Market serves as Third Ward destination and urban focal point



For information on incorporating indoor/outdoor space see: [LEED Open Space credit](#)



Colective on the Lake Coffee Shop's outdoor plaza

BUILDING DESIGN

PURPOSE: Utilize timeless design principles that fit within the unique context of Milwaukee to create an urban fabric that is human-scaled and enhances a sense of community among neighborhood residents.

The building design should address the uses and activities of the project such as open space principles and use the scale and relationship between existing buildings to express material elements experienced by the public.

1. BUILDING USES & OPEN SPACE

Thoughtful building design maintains an attractive, "people-friendly" environment that is inviting to the public and adapts over time.

- A. Locate uses and services frequently used by the public in visible or prominent areas, such as at entries or along the street front.
- B. Create open indoor/outdoor space to encourage interaction with the nature, social interaction, and physical activity especially on sites adjacent to the river.

Recommendations:

 - Orient building elements such as main entries, lobbies, windows, and balconies to face public parks, plazas, and open spaces.
 - Integrate water features and/or public art to enhance the public open space.
 - Develop locally-oriented pocket parks that incorporate amenities for nearby patrons.
- C. Build in flexibility so the building can adapt over time to evolving needs, such as the ability to change residential space to commercial space as needed.
- D. Locate interior uses and activities to take advantage of views and physical connections to exterior spaces and uses, particularly activities along sidewalks, parks or other public spaces.
- E. Choose locations for vehicular access, service uses, and delivery areas that minimize conflict between vehicles and non-motorists wherever possible.

Recommendations:

 - Using existing alleys for access or choosing a location for street access that is the least visually dominant and/or which offers opportunity for shared driveway use.
 - Where driveways and curb cuts are unavoidable, minimize the width as much as possible.
 - Employ a multi-sensory approach to areas of potential vehicle and pedestrian conflict such as garage exits/entrances. Design features may include contrasting or textured pavement or warning lights and sounds.



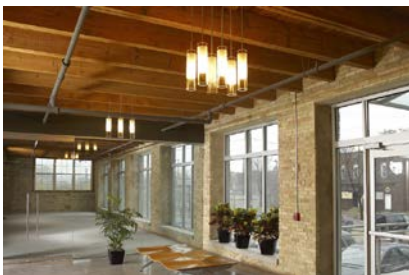
The Brewery development blends tradition architecture with modern design



For more information see:
[ReFresh Milwaukee Sustainability Plan](#)



For information on pedestrian-friendly design see:
[Streetscape Guidelines](#)



234 Florida Building converted the abandoned factory in sustainable, innovative office building

- F. Locate and design service entries, loading docks, and trash receptacles away from pedestrian areas or to a less visible portion of the site to reduce possible impacts of building aesthetics and pedestrian circulation.

2. ARCHITECTURAL CONCEPT & CONNECTION

The building concept should create a uniform and inviting sense of place that fits within the existing urban fabric.

- A. Ensure that the scale and design of new buildings are compatible with adjacent buildings.

Recommendations:

- At pedestrian areas of the building use awnings, balconies, landscaping, windows, and doors to lower the scale of the building.

- B. Built to street edge especially on street corners to promote interaction between pedestrians on the street and businesses. When buildings cannot be at property lines, minimize parking along the street frontage.

Recommendations:

- Emphasize the corner with business signs or marquees.
- Incorporate distinctive paving treatments and right-of-way elements in building corner setback areas.
- Integrate a unique design to highlight the corner and enhance retail opportunities.

- C. Use pedestrian-friendly design to create attractive, comfortable, and safe walking environment.

Recommendations:

- Maintain a convenient access route for pedestrian travel where a public right-of-way exists or has existed.
- Develop and define the different zones of a sidewalk: building frontage zone, street furniture zone, movement zone, and the curb.
- Provide safe, comfortable places where people can socialize and rest.

- D. Design a principal façade and obvious entrance parallel to the street edge. Do not face blank walls towards public streets.

Recommendations:

- Add depth to facades where appropriate by incorporating balconies, canopies, awnings, decks, or other secondary elements into the façade.
- Add detailing at the street level in order to create interest for the pedestrian and encourage active street life such as distinctive door and window hardware, projecting window sills, and ornamental tile or metal.

- E. Develop signage within the context of architectural and open space concepts, and coordinate the details with façade design, lighting, and other project features to complement the project as a whole.



Potawatomi Casino reduced energy consumption by 30% of standard use and has onsite renewable energy



For more information see:
[State of Wisconsin Building Code](#)
 &
[Saving Energy in Commercial Buildings Checklist](#)



For more information on energy efficient equipment and appliances see:
[Energy Star](#)



For more information see:
[Wisconsin Focus on Energy Design Assistance Program](#)

ENERGY USE

PURPOSE: Generate operating cost savings by designing for energy efficiency and ensuring that the building is capable of operating in accordance with its design.

Building design should address energy efficiency, daylighting techniques, building commissioning, improved systems controllability and improved aesthetics.

1. ENERGY EFFICIENCY

Simple energy-saving techniques and technologies generate significant operating cost savings.

- A. Design for energy performance that improves upon State of Wisconsin Building Code by 25%, and demonstrate energy efficiency using hourly simulation tools. Utilize the NREL Saving Energy in Commercial Buildings Checklist.

Recommendations:

- Group spaces for similar functions or requirements to concentrate similar heating and cooling demands, and use non-program spaces as climate buffers. Comply with the mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard.
- Use thermal mass such as masonry or concrete to moderate interior temperatures and to achieve desired R-value in foundation, walls and roof.
- Design air-lock entrances to reduce heat loss or gain.
- Use Energy Star Roof-compliant, high reflectance and high emissivity roofing to reduce heat retention in summer, unless using a green roof.

- B. Specify Energy Star equipment and appliances.

- C. Consider separate circuitry to isolate HVAC, lighting and plug loads, enabling operations and maintenance staff to monitor energy use on site.

2. DAYLIGHTING & INTERIOR LIGHTING

Daylighting and efficient interior lighting reduce energy use and create a pleasant, productive work environment.

- A. Maximize daylight in your building through the appropriate use of the following strategies.

Recommendations:

- Maximize window height, and use roof monitors, clerestory windows, skylights, and light-pipe technology to transmit light to spaces not reachable by other means.
- Balance glazing color for view, daylight and energy performance.



For more information see:
[High Efficiency Troffer Performance Specification](#)



Milwaukee Public Museum has 234 solar panel that generates 7,500 kilowatt hours of electricity a year



For more information see:
[Advanced Energy Design Guide for Small to Medium Office Buildings](#)

For more information see:
[Energy Star Portfolio Manager](#)

(Note that City of Milwaukee zoning ordinance requires that street level glazing must be at least 65% transparent.)

- Use interior windows, light shelves and low partitions to bring daylight deeper into the space, manage glare, and balance light levels.
- Use south-facing windows with appropriate overhangs to reduce summer sun and admit winter sun.

B. Install daylight responsive controls in 100% of indoor areas.

Recommendations:

- Rely on low ambient lighting levels for general illumination boosted by high quality, flexible task lighting. For general office space and non-critical manufacturing task areas, consider achieving a lighting power density (LPD) goal of between 0.8 and 1.0 watts/ft².
- Use high efficiency lamps and luminaires or LED's with electronic ballasts.
- Employ efficiency-based controls such as dimmers, occupancy sensors, and lumen maintenance controls.
- Wire luminaires parallel to walls with windows so they can be dimmed or turned off by row.

3. ALTERNATIVE ENERGY

Alternative conventional and renewable energy sources reduce your energy costs and your impact on natural resources.

- Consider closed-loop ground-source (geothermal) heating and cooling. Purchase Renewable Energy Credits (RECs) or install onsite renewable energy in the form of small wind, solar hot air, solar hot water, solar electric or ground source heating/cooling.

4. BUILDING COMMISSIONING (Quality Control)

Building Commissioning is a systematic and documented process of ensuring that the owner's operational needs are met, building systems perform efficiently, and building operators are properly trained.

- Contract with an independent commissioning authority from the beginning of the design process to review design options and expected operation of building and its component systems.
- Have commissioning agent train building staff to operate and maintain the building.
- Utilize responsive control systems for lighting, HVAC, and/or the entire building.
- Use long-term continuous measurement of performance for building and site systems.

Recommendations:

- Utilize Energy Star's Portfolio Manager to manage and track your energy and water use, it also can be used to see how your estimated design energy stacks up against similar existing buildings nationwide.



The Global Water Center in an adaptive reuse of an existing building and incorporated recycled material



For information on restoring historic building see:
[US Department of the Interior Rehabilitation Guidelines](#)



For more information see:
[South Coast Air Quality Management District Rule #1168](#)



For more information see:
[Green Label Indoor Air Quality Test Program](#)

MATERIALS & RESOURCES

PURPOSE: Reduce impact on natural resources as well as reduce costs, increase performance and improve aesthetics, and the working environment.

Selection of building materials and resources should involve consideration of available and renewable natural resources in addition to more traditional criteria such as cost, durability, performance, and aesthetics.

1. EXTERIOR & INTERIOR MATERIALS

Using building materials with low life cycle costs, high-recycled content and low toxicity reduces environmental impacts.

- A. Reuse existing building shells and components where feasible.
- B. If on-site reuse is not possible, create a demolition management plan that identifies opportunities to reuse, recycle or sell salvaged materials.
- C. For historic buildings (constructed before 1935), make changes to exterior in accordance with US Department of the Interior Rehabilitation Guidelines.
- D. Locate sources of the following building materials, and try to achieve the following goals:
 - o Use 25% materials with post-consumer and post-industrial recycled content.
 - o Use 20% materials and products that are manufactured within a radius of 500-mile radius.
 - o Specify US Forest Stewardship Council-certified wood-based materials and products for 25% of all wood used in the project.
- E. Specify mold- and moisture-inhibiting construction materials.
- F. Use low or no-VOC sealants and adhesives. Adhesives, Sealants and Sealant Primers that comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.
- G. Use paints and coatings that are certified by Green Seal for VOC and chemical component limits.
- H. Use carpet systems that meet the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program.
- I. Use composite wood and agrifiber products that do not contain added urea-formaldehyde resins.



Discovery World has an innovative pump system using lake water to cool the building



For more information see:
[EPA WaterSense-certified products](#)

- J. Specify building materials (e.g. insulation, carpet pad) that do not use CFC's or HCFC's as foaming agents or in other parts of the manufacturing products.
- K. Use CFC-free HVAC&R equipment.

2. WATER CONSERVATION

Off-the-shelf technologies can significantly reduce water consumption and associated costs.

- A. Employ whole-building design strategies and use high-efficiency plumbing fixtures to reduce aggregate water use.

Recommendations:

- Use lavatory faucet aerators.
- Low-flow electronic sensor faucets in lavatories or provide lavatories with pedal controls.
- Utilize low-flow bathroom fixtures including low-flow or dual flush toilets.
- EPA WaterSense-certified fixtures and fixture fittings should be used where available.



Construction of Northwestern
Mutual Tower



For more information see:
[WasteCap Resource Solutions](#)



For more information see:
[Wisconsin Administrative Code
NR 216](#)
&
[City of Milwaukee Chapter 290](#)

CONSTRUCTION & DEMOLITION

PURPOSE: Improve construction and demolition waste management practices to reduce waste, costs and environmental impacts of demolition and construction activities and transform wastes into resources.

The construction and demolition should involve the protection of indoor/outdoor air and water quality through the site as well as reducing environmental impacts due to waste.

1. WASTE & RECYCLING

Reduce, Reuse and Recycle construction and demolition waste to protect on-site materials and reduce environmental impacts.

- A. Reuse existing building shells and components.
- B. Implement a Construction or Demolition Waste Management Plan to recycle and/or salvage at least 75% of construction, demolition and land clearing waste. Include waste reuse and recycling in project specifications.

Recommendations:

- Identify a Plan Manager.
- Identify opportunities to reduce site disturbance and minimize environmental impact of construction activities. Seek help from WasteCap Resource Solutions.
- Create a list of materials to be separated for recovery and designation of areas for collection.
- Divert landscape waste from the waste stream via mulching, composting or other low-impact means.
- Create a plan to educate workers about separation requirements.
- Identify on-site soils management, including areas of concern, types of contamination and disposal or encapsulation methods.
- List sorting/separation/tracking rules.

2. EROSION DUST CONTROL

Appropriate control measures protect air and water quality.

- A. Create and implement an Erosion and Sedimentation Control Plan for all construction activities.

Recommendations:

- Follow Wisconsin Administrative Code NR 216 and City of Milwaukee Chapter 290 regardless of the size of disturbance.
- Utilize the best management practices in the EPA's Storm Water Management for Construction Activities (or local regulations if they meet or exceed the EPA Standards).



Installed and maintained properly, barriers make excellent dust and wind current control

- B. Decrease work during high winds and spray loose soils with water or utilize another erosion control technique.

3. PRE-OCCUPANCY CONTROLS FOR INDOOR AIR QUALITY

Protection of mechanical equipment and building materials during construction will ensure healthy indoor air quality after occupancy.

- A. Protect stored on-site or installed absorptive materials from moisture damage and mold, and replace all filtration media immediately prior to occupancy.
- B. Install wet materials before dry in construction sequence to reduce indoor air pollutants.
- C. Consider a two-week flush of systems at 100% outside air before occupancy.



Clock Shadow Building uses exterior louvers for sun-shading

INDOOR ENVIRONMENTAL QUALITY

PURPOSE: Provide a healthy and productive environment for facility occupants; increase the comfort and alertness of occupants; improve productivity and reduce absenteeism.

Good indoor environmental quality encompasses such factors as temperature and relative humidity, adequate ventilation, visual comfort, and noise control.

1. INDOOR AIR QUALITY

Indoor air quality affects occupants' health, which can impact absenteeism rates and employee productivity.

- A. Meet the minimum requirements of voluntary consensus standard ASHRAE 62.1-2013, Ventilation for Acceptable Indoor Air Quality, and approved Addenda using the Ventilation Rate Procedure.
- B. Replace all filtration media immediately prior to occupancy using filtration media that have a Minimum Efficiency Reporting Value (MERV) of 13, as determined by ASHRAE 52.2- 2007.

- C. Provide for the use of natural ventilation in transition seasons. Take advantage of cross ventilation, prevailing winds and stack effects when possible.

Recommendations:

- Each room should have two separate supply and exhaust opening with window openings that are operable by the occupants.
- Inlets should supply air low in the room. Outlets should be located across the room and at a high level.
- The vertical distance between the inlet and exhaust openings should take advantage of the stack effect by using skylights or ridge vents.

- D. Provide direct exhaust for all spaces that generate moisture and pollutants, including manufacturing, toilet and locker rooms, copy rooms and rooms where chemicals and cleaners are stored.
- E. Provide and design mats or grills at entry areas to control dirt and dust.
- F. Consider a carbon dioxide monitoring system in spaces of variable occupancy to provide feedback on space ventilation performance. Specify initial operational set point parameters to ensure indoor carbon dioxide levels do not exceed outdoor levels by more than 530 ppm at any time.



Urban Ecology Center uses stack effect ventilation and operable windows to improve indoor air quality



For more information see:
[LEED Acoustic Performance Credit](#)

2. ACOUSTIC QUALITY

Improved acoustic quality ensures high employee productivity, attention span and minimizes stress.

- A. Maintain a maximum interior Noise Criteria of 35 decibels in occupied areas.

Recommendations:

- Ceiling panels and carpeting can assist in absorbing sound.
 - Mitigate excessive outdoor noise with envelope measures (e.g. better windows) or HVAC baffles at the outdoor air intake and exhausts.
- B. Place acoustic buffers (corridors, lobbies, stairwells, storage rooms, etc.) and sound-insulated partitions between noise-producing spaces and noise-sensitive areas.
- C. Place vibrating equipment on isolation pads and enclose in sound-absorbing walls, floors, and ceilings.
- D. Reduce background noise level 1 to 40 dBA or less from heating, ventilating and air conditioning (HVAC) systems in classroom and other core learning spaces.
- E. In other areas, specify windows rated at 35 or better.



Indar-Ingeteam's building in the Menomonee Valley implemented an energy measurement and verification plan for post-construction occupancy



For information on eco-friendly cleaning products see:
[Green Seal](#)



For more information see:
[Living Building Challenge](#)
[Inspiration & Education credit](#)

OPERATIONS & MAINTENANCE

PURPOSE: Ensure the building operates at its designed efficiency, reducing costs and increasing occupant productivity over the full life of the facility.

1. OPERATION MANUAL & MONITORING

A building that is operated in accordance with its design and construction will maintain its value and continue its high performance.

- A. Prepare an Operations & Maintenance manual, including monitoring of energy use, luminaire and filter maintenance, in accordance with ASHRAE 4-1993. This plan should clearly describe the principles of design intentions, O&M procedures, and should be accessible to building occupants.
- B. Schedule regular systems review and maintenance.
- C. Prepare an operational waste prevention and recycling plan.
- D. Design to accommodate areas for recycling of waste materials.

2. FACILITY MAINTENANCE

Proper housekeeping and operations activities can protect the health and comfort of occupants and decrease the impact of the building on the environment.

- A. Maintain healthy and efficient custodial operations using Green Seal or equivalent cleaning products.
- B. Frequently inspect for fungus and molds.
- C. Form an in-house "Green Team" to raise awareness of workplace associated environmental concerns.
- F. Provide centralized ground-floor location for collection and storage of recyclables.

Recommendations:

- Train occupants on recycling procedures.
 - Consider incorporating recycling facilities such as compactors, chutes or other technologies to accommodate predicted volumes.
- D. Do not store materials, products or equipment outdoors, except finished product in transit and company-owned vehicles.



For a detailed green
infrastructure maintenance plan
see:

[MMSD's Elements of a Green
Infrastructure Maintenance
Business Plan](#)

3. MAINTENANCE AND STEWARDSHIP OF SITE & LANDSCAPE ELEMENTS

Proper long-term maintenance of landscape elements will maintain their aesthetic beauty and financial value.

- A. Prepare and implement a landscape care and maintenance manual or plan to sequence actions that are intended by the landscape designer.